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# AI Integration in Primary Science Instruction: A Technology Acceptance Model (TAM)-Based Study on Teachers' Readiness to Use ChatGPT

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The unsatisfactory performance of Malaysian students in the 2023 Trends in Mathematics and Science Studies (TIMSS) assessment highlights the need for innovative and effective approaches in science instruction. One potential solution is the integration of artificial intelligence (AI), particularly ChatGPT. However, there is a need to access science teachers' readiness to use ChatGPT in the teaching and learning of science to ensure its benefits are fully utilized. Therefore, this quantitative study with a survey research design aims to access science teachers' readiness to use ChatGPT in science instruction based on the Perceived Usefulness and Perceived Ease of Use, two factors in the Technology Acceptance Model (TAM). Based on the Krejcie and Morgan sample size determination table and using stratified random sampling, data were collected from 80 science teachers in the district of Keningau, Sabah, through questionnaires and analyzed using descriptive statistics. Findings of the study showed a moderate level of readiness among science teachers to use ChatGPT in science instruction, suggesting general acknowledgement of ChatGPT's benefits but indicating the need for continuous support and training as several science teachers were facing difficulties in mastering its features. This study recommends the implementation of ongoing professional development programmes along with comprehensive technical support and clearer AI alignment with existing curriculum to help science teachers feel more confident and better equipped to use AI tools in their teaching and learning practices.

Keywords: artificial intelligence (AI), ChatGPT, science teachers, science instruction, technology acceptance model (TAM)

## INTRODUCTION

The rapid advancement of Information and Communication Technology (ICT) in recent years has been decisive in impacting every aspect of people's lives (Gousiou & Grammenos, 2023). With the integration of Artificial Intelligence (AI) into ICT, various sectors around the world have been transformed (Rashid & Kausik, 2024) and education is emerging as one of the most promising areas of the transformation, offering a mix of opportunities and challenges in students' academic development (Edtech, 2020; Vieriu & Petrea, 2025). In recent years, AI has revolutionized education (Holmes et al., 2019) and address the diverse needs of learners by providing personalized learning experiences (Hwang et al., 2020), adaptive feedback (Kenshinbay, 2024), real-time feedback (de Laat et al., 2020), optimize resource allocation (Ajuwon et al., 2024), intelligent tutoring systems and learning analytics dashboards. Technology-enhanced instruction has evolved from traditional platforms to more intelligent, AI-driven adaptive systems (Kenshinbay, 2024) and are implemented in diverse ways such as automated content generation and personalized lesson planning (Kasneci et al., 2023; Jahwari & Yousif, 2024).

These AI-driven innovations are not only reshaping traditional teaching methods but also supporting teachers in managing real classroom challenges such as large class sizes, varied student abilities and

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the need for more personalized support, making teaching and learning more effective and inclusive. This aligns with Takona (2024), who emphasizes that AI not only facilitates the learning process but also offers flexible solutions by tailoring content and teaching methods to meet each student's unique needs. In response to the growing influence of AI on education globally, the Malaysian government recognizes the need to embrace AI to ensure the nation's education system remains relevant and competitive in the 21st century, thus leading to the introduction of the Digital Education Policy, a forward-thinking initiative designed to effectively integrate AI tools into teaching and learning. With this initiative, the policy seeks to create a more inclusive, personalized and future-ready educational environment for all learners *(Ministry of Education Malaysia [MOE], 2023).*

One of the most transformative AI-powered applications in the field of education is ChatGPT. As a Natural Language Processing (NLP) model, ChatGPT has revolutionized educational practices (Bouschery et al., 2023; Yeruva, 2023) by challenging conventional pedagogical approaches and redefining how knowledge is delivered and acquired (Sarwar, 2024). According to Han et al. (2021), the education landscape is constantly evolving to meet the needs of society and keep up with advances in technology and knowledge, with STEM education becoming a key part of this evolution. As societies become increasingly reliant on scientific knowledge and innovation, science education has gained significant global attention as pillars of national development and an essential means of addressing social, economic and environmental challenges (Pei & Zheng, 2021).

In addition to its role in fostering scientific literacy, science education plays a crucial part in developing essential 21st-century competencies such as creativity, critical thinking, communication and collaboration (Haryani et al., 2024), which are important to enable learners to solve complex problem, make informed decisions and adapt effectively to the challenges of a rapidly changing, technology-driven world. In the context of the Malaysian education system, science education holds particular significance in the country's broader vision of achieving a high-income, knowledge-based economy status. The **Malaysian Education Blueprint 2013-2025 (MOE, 2013)** emphasizes the importance of enhancing science education to foster scientific literacy, promoting innovation and preparing students for the demands of a globalized and technologically advanced society.

Although science education has long been a priority in Malaysia, the unsatisfactory performance of Malaysian students in the 2023 Trends in International Mathematics and Science Study (TIMSS) assessment, particularly in science, highlights the need for improvement and reform in the teaching and learning of science (Bahagian Perancangan dan Penyelidikan Dasar Pendidikan, 2024; "MOE Identifies Challenges in Maths, Science Learning Among Students", 2024; von Davier et al., 2024). As shown in Figure 1, Malaysia's score in science in TIMSS 2023 is 426, which is below the international average score of 478. Moreover, this score is even lower than Malaysia's performance in TIMSS 2019.

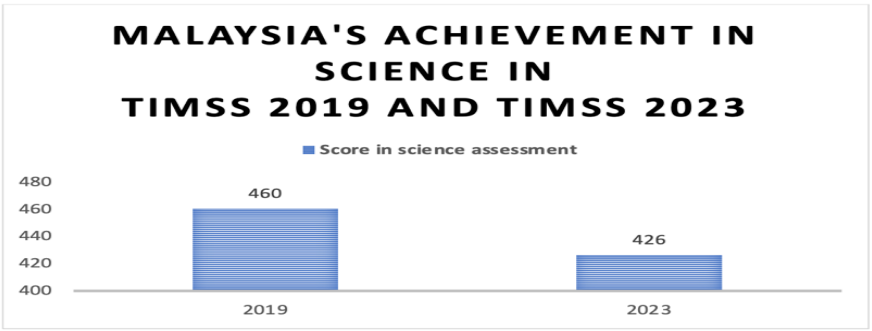


Figure 1
Malaysia's achievement in science in TIMSS 2019 and TIMSS 2023

Addressing similar challenges worldwide, numerous studies have highlighted the potential of AI-driven instruction to enhance learning outcomes through differentiated teaching and cognitive scaffolding (Ajuwon et al., 2024; Hongxia & Razali, 2025). Among such tools, ChatGPT has emerged as a promising AI tool capable of transforming and enhancing science instruction. However, despite the growing body of literature highlighting positive attitudes towards its use (Ajlouni et al., 2024; Geddam et al., 2024), the impact of ChatGPT on student achievement remains inconsistent, especially within the Malaysian context.

This raises a critical question: Could the decline in science performance among Malaysian students be associated with the limited or ineffective use of AI tools such as ChatGPT in the classroom? While ChatGPT offers considerable potential to support personalized learning and instructional efficiency, its successful integration depends largely on teachers' readiness and competence in using it. Zahri et al. (2023) states that beyond awareness, teachers' willingness and preparedness to adopt such technologies play an important role in ensuring their meaningful impact on instructional practices. Studies by Alshorman (2024) and Čipková and Karolčík (2018) indicate that the effective integration of AI in science instruction largely depends on the readiness and preparedness of science teachers. However, the potential impact of this integration can only be achieved if teachers feel confident and prepared to implement it in their teaching and learning practices (Ayanwale et al., 2022; Lindner & Romeike, 2019). Assessing Malaysian science teachers' readiness to use AI tool is important to ensure its benefits are fully understood, effectively implemented and maximized to enhance student performance and improve the delivery of lessons among science teachers. To access science teachers' readiness to use ChatGPT in science instruction, this study adopts the Technology Acceptance Model (TAM) framework developed by Davis (1989). The model serves as a basis for assessing science teachers' readiness to use ChatGPT in their teaching practices based on two factors which are Perceived Usefulness and Perceived Ease of Use. While AI tools have the potential to transform teaching and learning experiences, it won't reach its full potential unless educators are well-equipped and confident in using it. Assessing the readiness of Malaysian science teachers is a critical step in ensuring that ChatGPT integration truly benefits student learning. Therefore, the aim of this study is to access the level of science teachers' readiness to use ChatGPT in science instruction based on the factors of Perceived Usefulness and Perceived Ease of Use.

## LITERATURE REVIEW

### ChatGPT

ChatGPT, or Chat Generative Pre-Trained Transformer, is an AI-powered language model developed by OpenAI that can understand and generate human-like text based on user input (Roumeliotis & Tselikas, 2023). At its core, it is designed to analyze, interpret and produce language using NLP and machine learning technologies. These tools allow ChatGPT to process vast amounts of human-generated content, such as text and speech, enabling it to respond in ways that feel natural and intuitive. As a form of generative AI, ChatGPT can produce various types of content, including text, images, audio and video. Specifically, it excels at generating written responses, ranging from brief answers to extended essays and interactive dialogues, by leveraging deep learning models (Jo & Park, 2024; OpenAI, 2023). Its ability to communicate in a human-like manner has made it increasingly useful across various fields, including content creation, answering queries and brainstorming ideas (Orrù et al., 2023; Verma, 2023).

The growing use of ChatGPT in education has not only accelerated the adoption of AI-driven learning tools but has also brought meaningful changes to teaching approaches and educational policies (Jahwari & Yousif, 2024; Al-Mamary et al., 2024). **Educators and students have started using it for a variety of tasks, such as drafting assessments, composing essays, translating texts, answering complex questions, summarizing information and engaging in interactive learning.**

Based on the study by Hongxia and Razali (2025), the integration of ChatGPT in the teaching and learning of English as a foreign language (EFL) significantly enhanced Chinese EFL undergraduates' academic writing performance in terms of content development, grammar, coherence, vocabulary and structure. In addition, more than 60% of students reported increased affective, cognitive, behavioural, and social engagement, which affirms ChatGPT's potential in supporting self-directed and motivated learning within academic writing contexts.

**Technology Acceptance Model (TAM)**

The Technology Acceptance Model (TAM) is a model used to explain and predict individuals' acceptance of technologies (Davis, 1989), which relates user beliefs, attitudes, intentions and behaviour to predict technology acceptance (Bedregal-Alpaca et al., 2019). The model identifies two fundamental factors that influence the adoption of technology: **Perceived Usefulness,** which refers to the degree in which an individual believes that using a particular technology will enhance their performance, and **Perceived Ease of Use,** which refers to the extent in which the technology is perceived as free of effort. Based on the model, an individual's decision about how and when they will use a particular technology is primarily shaped by their perceptions of these two key factors. These perceptions would then influence how an individual feel about the technology, which in turn shape their intention to use it and ultimately leads to actual use of the technology. Over time, the Technology Acceptance Model (TAM) has evolved to incorporate additional elements such as **Attitude Toward Using, Behavioural Intention to Use** and **Actual Use.** These additions have enriched the model, offering a more comprehensive and detailed understanding of how and why individuals adopt technology (Venkatesh & Davis, 2000). The Technology Acceptance Model (TAM) has been widely applied in the field of education to assess teachers' acceptance of emerging technologies with studies showing that the factors of Perceived Usefulness and Perceived Ease of Use have significantly affect teachers' willingness to integrate educational technologies, including AI tools, into their classroom practices (Teo, 2011).

**Science Teachers' Readiness to use ChatGPT in Science Instruction**

The use of AI in education is rapidly expanding and AI-powered tools such as ChatGPT are starting to make their presence in science classrooms. Recent studies have highlighted the ability of ChatGPT to transform the teaching and learning experience by encouraging student engagement, promote independent learning and assist teachers in managing diverse classroom needs (Kasneci et al., 2023; Zhai, 2022). **Despite its growing presence,** the successful integration of ChatGPT in science instruction depends significantly on teachers' readiness to adopt and use it effectively (Alshorman, 2024)**.** In the context of this research, readiness refers to the extent in which science teachers are prepared to adopt and effectively integrate ChatGPT into their instruction practices. This involves their perceptions of ChatGPT's potential to enhance teaching and learning (Perceived Usefulness) and their confidence in using it with minimal effort (Perceived Ease of Use) (Chui et al., 2023; Davis, 1989). There is a need to determine science teachers' readiness to use ChatGPT, as their willingness to adopt such technologies directly determines the success of AI integration in the classroom. Without adequate readiness, the implementation of AI tools may be superficial or inconsistent, thereby diminishing their potential to enhance teaching and learning (Purnama et al., 2025; Teo, 2011). Figure 2 shows the Technology Acceptance Model (TAM) framework proposed by Davis (1989) while Figure 3 shows the conceptual framework developed for this study based on the framework of the Technology Acceptance Model (TAM).

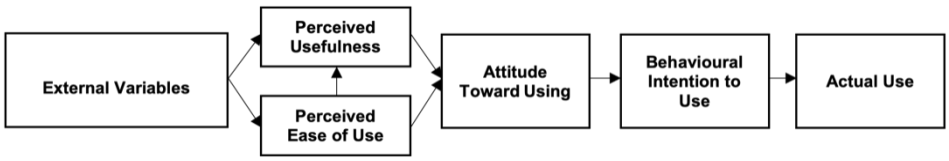


Figure 2
Framework of the technology acceptance model (TAM) (Davis, 1989)

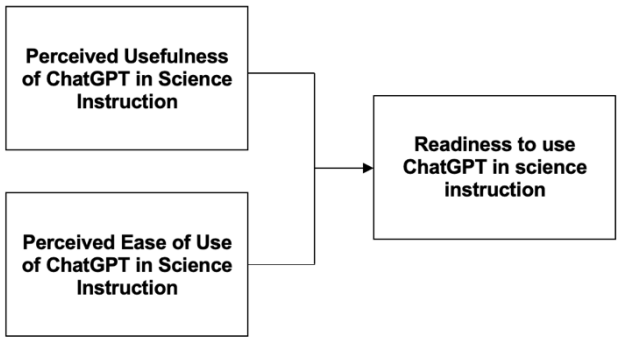


Figure 3
Conceptual framework of science teachers' readiness to use ChatGPT in science instruction

## METHOD

### Research Design

This study uses a quantitative descriptive approach with a survey design, which enables the systematic collection of numerical data from a sample of science teachers. The use of this design is appropriate for identifying patterns, trends and generalizations regarding science teachers' readiness to use ChatGPT in science instructions.

### Study Samples

The target population for this study consisted of 99 primary school science teachers in the district of Keningau, Sabah. These teachers, known as respondents in this study, were eligible to be selected based on the following criterion: (i) the respondents are currently teaching science at the primary school level and (ii) had at least heard of or were aware of ChatGPT. Based on the **Krejcie and Morgan (1970)** sample size determination table, a sample size of **80** is considered adequate for a population of 99. Stratified random sampling was used in this study, with science teachers' years of teaching experience serving as the basis for stratification. The population was divided into five strata as follows: 1 to 5 years of teaching experience, 6 to 10 years of teaching experience, 11 to 15 years of teaching experience, 16 to 19 years of teaching experience and more than 20 years of teaching experience. A proportionate number of teachers were randomly selected from each stratum using a random number generator. This method ensures that each subgroups of years of teaching experience were fairly represented among the respondents and supported the generalizability of the findings, consistent with the study's positivist and quantitative approach. Years of teaching experience was used as the stratification variable to divide the respondents into subgroups as it plays a significant role in influencing teachers' attitudes, confidence and readiness to adopt new technologies, particularly AI tools such as ChatGPT. According to the Technology Acceptance Model (TAM), factors such as Perceived Usefulness and Perceived Ease of Use can be influenced by prior teaching experience,

familiarity with technology and pedagogical maturity, which tend to increase with teaching experience (Teo, 2011; Venkatesh & Davis, 2000).

**Research Instrument**

The research instrument used in this study is a questionnaire adapted from Amoroso & Hunsinger (2009), Davis (1989), Kong et al. (2024) and Tangkui et al. (2023). The questionnaire was modified to suit the context of this study, which aims to explore the level of science teachers' readiness to use ChatGPT in their teaching practices. The questionnaire comprises three sections: i) respondents demographics (Section A), science teachers' Perceived Usefulness of ChatGPT in science instruction (Section B) and science teachers' Perceived Ease of Use of ChatGPT in science instruction (Section C). At the beginning of the questionnaire, respondents will answer a screening question to determine their usage of ChatGPT in science instruction. The items in Section A covers the respondents' gender, age and teaching experience. A total of 8 items were used in Section B while another 8 items were used in Section C. Responses were collected using a 5-point Likert scale ranging from 'Strongly Disagree' to 'Strongly Agree'. This scale was used to assess science teachers' readiness to use ChatGPT, based on the two key factors derived from the Technology Acceptance Model (TAM). The level of readiness among science teachers to use ChatGPT in science instruction was determined based on the mean interpretation score as suggested by Nyutu et al. (2021) in Table 1.

Table 1
Interpretation of science teachers' readiness to use ChatGPT in science instruction based on mean score

| Mean score | Interpretation |
|---|---|
| 1.00 – 1.80 | Very low |
| 1.81 – 2.60 | Low |
| 2.61 – 3.40 | Moderate |
| 3.41 – 4.20 | High |
| 4.21 – 5.00 | Very high |

Source: Nyutu et al. (2021)

The validity of the questionnaire was determined through expert validation, focusing on both face and content validity. Three experts were involved in the validation process. The first expert is a science teacher with more than 20 years of experience in teaching science while the second expert is a lecturer specializing in Educational Technology from an Institute of Teacher Education in the state of Sabah. Both these experts evaluated the content of the questionnaire to ensure the constructs were relevant, comprehensive and aligned with the study's objectives. The third expert is also a lecturer from an Institute of Teacher Education in the state of Sabah, specializing in the Malay language. Revision involving the use of language, grammar and overall presentation of the questionnaire were carried out by the third expert to ensure clarity, readability and appropriateness of the statements in the items.

A pilot study was conducted to obtain an initial overview of the potential research findings and to assess the reliability of the questionnaire. In selecting participants for the pilot study, the researcher referred to Totton et al. (2023), who suggested that a sample size of 30 is adequate and acceptable for preliminary testing. To ensure the relevance and applicability of the findings, the participants chosen shared similar characteristics with those of the intended target group, as recommended by Nadhilah and Kamarul Shukri (2019). Data collected from the pilot study were then analyzed using Cronbach's Alpha coefficient value to evaluate the internal consistency of the questionnaire. The reliability coefficients for the items in Sections B and Section C are presented in Table 2. By referring to Nyutu et al. (2021), a Cronbach's Alpha coefficients value of 0.60 and above is considered to have an acceptable level of reliability.

Table 2
Reliability of questionnaire based on Cronbach Alpha coefficient value

| Section | Construct | Cronbach Alpha Coefficient Value |
|---|---|---|
| B | Perceived Usefulness of ChatGPT in science instruction | 0.83 |
| C | Perceived Ease of Use of ChatGPT in science instruction | 0.81 |

**Study Procedure**

The questionnaire was distributed to all science teachers in the district of Keningau using Google Forms via the school emails. Google Forms is a virtual form that allows the collection of information on science teachers readiness to use ChatGPT in their teaching practices. Respondents were given a period of two weeks to complete the questionnaire.

**Data Analysis**

Respondents' demographics were analyzed based on percentages, while respondents' level of readiness to use ChatGPT in science instruction were analyzed using descriptive statistics involving mean and standard deviation.

**FINDINGS**

**Respondents' Demographics**

Based on the analysis of the respondents' demographics, a total of 32 respondents were male science teachers, while 48 respondents were female science teachers. In terms of teaching experience, 17 respondents (21.25%) had more than 20 years of teaching experience, 24 respondents (30%) had between 16 to 19 years of teaching experience, 13 respondents (16.25%) had between 11 to 15 years of teaching experience, 19 respondents (23.75%) had between 6 to 10 years of teaching experience, and 7 respondents (8.75%) had between 1 to 5 years of teaching experience. These findings showed that most of the respondents were female science teachers, with most of the science teachers having between 16 and 19 years of teaching experience.

**Perceived Usefulness of ChatGPT in science instruction**

The results in Table 3 showed that respondents generally view ChatGPT as **moderately useful** in their teaching practices. The average mean score for this construct is **3.27**, which falls within the **moderate range** according to Table 1. Item 3 has the highest mean score (M = 3.35) while item 4 has the lowest mean score (M = 3.18). The average standard deviation of **0.76** indicates a **moderate level of variability**, suggesting that science teachers' experiences and perceptions are somewhat consistent but not constant.

Table 3
Mean and standard deviation for perceived usefulness of ChatGPT in science instruction

| No. | Item | Mean | Standard Deviation |
|---|---|---|---|
| 1. | Using ChatGPT helps me explain complex science concepts more effectively to my students. | 3.32 | 0.78 |
| 2. | ChatGPT enhances my productivity when preparing science lessons. | 3.28 | 0.74 |
| 3. | ChatGPT supports me in providing instant and accurate answers to students' science-related questions. | 3.35 | 0.70 |
| 4. | ChatGPT assists me in developing diverse and engaging science activities. | 3.18 | 0.82 |
| 5. | Using ChatGPT allows me to address students' individual learning needs more efficiently. | 3.21 | 0.80 |
| 6. | Integrating ChatGPT into science instruction improves my students' understanding of science concepts. | 3.29 | 0.75 |
| 7. | The use of ChatGPT increases the overall effectiveness of my science teaching. | 3.30 | 0.68 |
| 8. | ChatGPT contributes positively to my students' interest and motivation in learning science. | 3.26 | 0.77 |
| Average | | 3.27 | 0.76 |

**Perceived Ease of Use of ChatGPT in science instruction**

The results in Table 4 showed a moderate level of agreement among respondents with an average mean score of 3.21. Item 15 has the highest mean score (M = 3.34) while item 13 has the lowest mean score (M = 3.05). The average standard deviation of 0.77 demonstrates a moderate variation in responses, which may be influenced by differences in aspects such as digital proficiency, experience with technology or exposure to AI tools in educational settings.

Table 4
Mean and standard deviation for perceived ease of use of ChatGPT in science instruction

| No. | Item | Mean | Standard Deviation |
|---|---|---|---|
| 9. | Learning to use ChatGPT for science instruction was easy for me. | 3.30 | 0.78 |
| 10. | Interacting with ChatGPT when preparing science lessons require little effort. | 3.18 | 0.74 |
| 11. | I find it easy to get ChatGPT to provide science content. | 3.26 | 0.70 |
| 12. | The features of ChatGPT are easy to understand and use for science teaching purposes. | 3.12 | 0.80 |
| 13. | I can quickly become skillful at using ChatGPT for science instruction. | 3.05 | 0.82 |
| 14. | ChatGPT makes it easy to modify or adjust the science content it generates to suit my lesson needs. | 3.24 | 0.76 |
| 15. | I can easily save time in preparing or delivering science content using ChatGPT. | 3.34 | 0.73 |
| 16. | I can easily use ChatGPT in my science lessons even without technical support. | 3.22 | 0.79 |
| Average | | 3.21 | 0.77 |

## DISCUSSION

Findings of this study addresses the primary aim of the research objective which is to access science teachers' readiness to use ChatGPT in science instructions, which were determined using two factors based on the Technology Acceptance Model (TAM) which are Perceived Usefulness and Perceived Ease of Use. The results showed that the overall mean score for the construct of *Perceived Usefulness*

*of ChatGPT in science instruction* was 3.27 while the overall mean score for the construct of *Perceived Ease of Use of ChatGPT in science instruction was* 3.21, both of which fall within the moderate range.

For the construct of *Perceived Usefulness of ChatGPT in science instruction*, Item 3 recorded the highest mean score of 3.35, indicating that science teachers highly valued ChatGPT's ability to provide instant and accurate answers to students' science-related questions, which they perceived as a significant support for effective lesson delivery. This aligns with the findings of **Zawacki-Richter et al. (2019)** and **Holmes et al. (2019), which stated that ChatGPT** can quickly access and process vast amounts of information, reducing response time and enhancing the accuracy of explanations. This ability not only improves instructional quality but also supports students' inquiry-based learning by delivering timely feedback. Furthermore, **Luckin et al. (2016)** stated that ChatGPT can function as a responsive educational assistant, offering information and clarification on complex science topics, which helps maintain classroom engagement and supports differentiated learning. However, Item 4 recorded the lowest mean score of 3.18, suggesting that while science teachers recognize ChatGPT's value in content delivery, they may find it less effective or more challenging to use for designing activities that would cater the diverse needs of students. This could be due to limited experience with effective **prompting** or uncertainty about how to translate AI-generated ideas into hands-on, inquiry-based or collaborative science tasks, which are key components of effective science instruction (Holmes et al., 2019; Crompton & Burke, 2022). Additionally, science teachers may perceive that ChatGPT's suggestions do not always align with **curriculum standards** or **local classroom contexts**, reducing their practical applicability. As highlighted by **Luckin et al. (2016)** and **Zhai (2022),** while AI tools can support the delivery of lessons, teachers often need additional training to implement them effectively in their instructional practices.

For the construct of *Perceived Ease of Use of ChatGPT in science instruction*, Item 15 recorded the highest mean score of 3.34, indicating that science teachers recognize ChatGPT's ability in enhancing efficiency. This aligns with the findings of **Venkatesh & Davis (2000)** and **Zhai (2022),** which highlighted that perceived time savings is a key factor influencing technology acceptance. ChatGPT's ability to quickly generate lesson content, explanations and assessment materials reduces the time teachers need to spend on preparation tasks. Additionally, the ease of accessing ready-to-use information and customizable teaching materials enables teachers to focus more on instructional delivery and student engagement. This time saving element likely contributes to science teachers' positive perceptions of ChatGPT as a practical support tool in their teaching workflow. However, Item 13 recorded the lowest mean score of 3.05, suggesting that science teachers may find it challenging to develop proficiency with the tool. This could be due to a **lack of formal training**, limited experience with effective prompting or unfamiliarity with how to effectively integrate ChatGPT into science instructions. As stated by **Teo (2011)** and **Venkatesh & Davis (2000)**, perceived ease of skill acquisition strongly influences technology acceptance and difficulties in learning to use AI tools can lower confidence and slow adoption. Moreover, **Zawacki-Richter et al. (2019)** emphasized that while AI tools can be powerful, educators often require **professional development** and continuous support to use them effectively across diverse instructional settings. This is consistent with previous studies that emphasized the role of digital literacy, professional development and teacher preparedness in ensuring the successful integration of AI tools in education (Ayanwale et al., 2022; Kenshinbay, 2024).

Findings of this study have several important implications for educational practices, policy and future research, particularly in the context of integrating AI tools such as ChatGPT in science instruction. This study has contributed to the **growing body of knowledge on AI integration in education** by offering empirical insights into Malaysian science teachers' readiness to adopt ChatGPT, guided by the Technology Acceptance Model (TAM). While previous studies have explored general teacher

attitudes toward AI (Kasneci et al., 2023; Geddam et al., 2024), few have specifically examined ChatGPT in the context of **science instruction in primary schools**, making this study contextually relevant. It also fills a gap identified by **Zahri et al. (2023),** who emphasized the need to investigate actual teacher usage and readiness in AI implementation to ensure effective classroom integration. At the same time, it is important for teachers to review and test AI-generate content before using it in their lessons to ensure its accuracy, relevance and appropriateness for student learning (Dertli & Yilzid, 2025).

The moderate levels of Perceived Usefulness and Perceived Ease of Use suggest that science teachers recognize the potential of ChatGPT but may require **support** to use it effectively. This is in line with earlier findings by **Alshorman (2024)** and **Ayanwale et al. (2022)**, which stated that teacher readiness is a key determinant of successful AI adoption. The results underline the need for **targeted professional development programs** focusing not only on the technical aspects of using ChatGPT but also on its pedagogical applications in science education. Educational stakeholders should consider embedding AI-related competencies into teacher training modules to bridge gaps in digital literacy and instructional competency.

The findings have implications as well for **policy implementation**, particularly in the context of Malaysia's **Digital Education Policy (MOE, 2023),** which promotes the use of AI in teaching and learning practices. For this policy to succeed, it must be based in the actual readiness levels of teachers. This study provides a baseline data that policymakers can use to design support systems that are responsive to teachers' needs. Finally, from a theoretical perspective, the study reinforces the relevance of **the Technology Acceptance Model** (TAM) in understanding technology adoption among educators by validating the model's applicability in the context of AI in science education. It also opens the door for extending **the Technology Acceptance Model** (TAM) to include additional variables such as attitude and intention to use as well as actual usage in future studies (Venkatesh & Davis, 2000; Teo, 2011).

## CONCLUSION AND SUGGESTIONS

In conclusion, while science teachers acknowledge the potential of ChatGPT to enhance their instructional practices, some uncertainty may remain, particularly regarding confidence in mastering the AI tool and applying it effectively in the classroom. These limitations may hinder the full and meaningful integration of ChatGPT in science instruction and could potentially affect the quality of teaching and learning if not addressed. To keep up with the demands of today's digital learning environment, teachers are encouraged to actively participate in professional development programs or workshops. These opportunities would help them strengthen their digital literacy skills and content knowledge, empowering them to become effective agents of technological change (Raman et al., 2019).

At the same time, **stakeholders such as MOE, Institute of Teacher Education and school leaders should** play a crucial role in supporting teachers by providing **accessible, relevant and ongoing professional development**. This may include workshops, training sessions, seminars or courses that would equip teachers with both technical and pedagogical competencies to effectively integrate ChatGPT in science instruction. With consistent support and capacity-building efforts, teachers will be more confident in using ChatGPT, thus contributing to their readiness to use ChatGPT in their teaching practices.

While this study provides valuable insights into science teachers' readiness to use ChatGPT in science instruction, further studies are needed to broaden and deepen the scope. These further studies could include involving larger and more diverse teacher populations across different districts, states or school types, analysing the influence of respondents' demographics, exploring additional Technology Acceptance Model (TAM) variables such as Attitude Toward Use, Behavioural Intention to Use and

Actual Use, conducting **longitudinal studies** to observe changes in readiness over time following training interventions, using **qualitative approaches** and investigating the impact of ChatGPT on student learning outcomes, such as understanding science concepts, engagement or critical thinking. These efforts will help build a more comprehensive understanding of AI integration in education and ensure that ChatGPT are used effectively and ethically to improve and enhance the teaching and learning of science.

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